

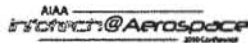


EO-1 Mission Autonomy Evolution

AIAA Infotech @ Aerospace 2010
Space Autonomy Session

Daniel Mandl - NASA/GSFC

4/21/10



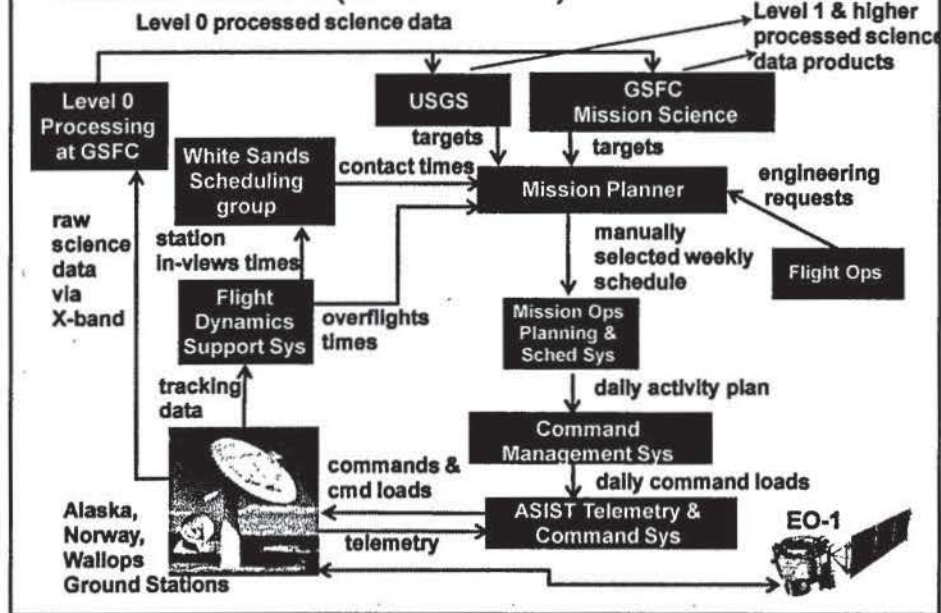
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Evolution of Automation and Autonomy Software on Earth Observing 1

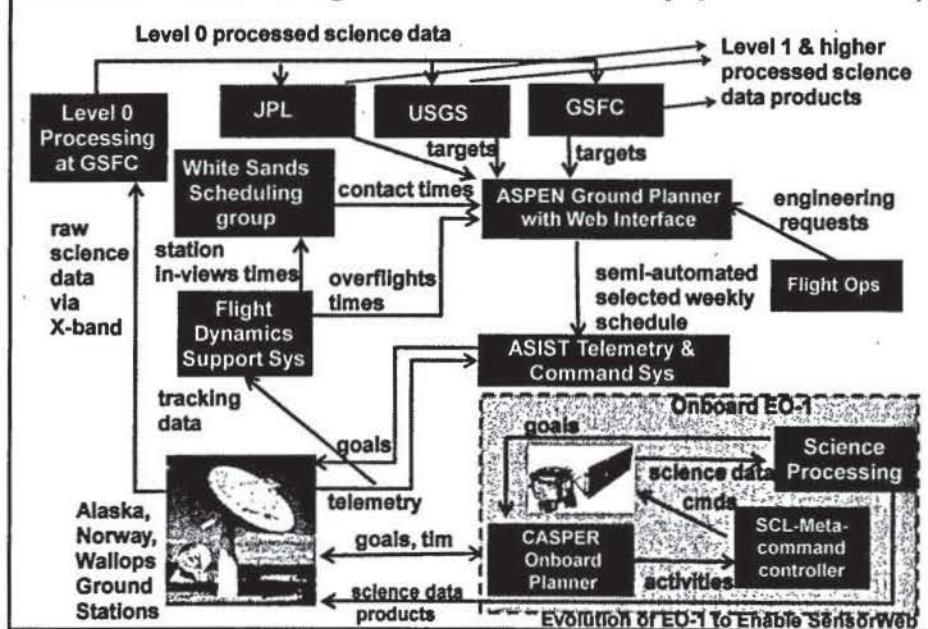
- Streamlined Earth Observing 1 (EO-1) operations over past 10 years by integrating automation and autonomy
 - Installed Autonomous Science Experiment (ASE) flight software in 2003
 - Added Open Geospatial Consortium (OGC) Sensor Web Enablement (SWE) compatible web service interfaces in 2008
 - Added OGC compatible data processing web service interfaces and software to automate data product production 2008/2009
 - Added Campaign Manager for workflow management to orchestrate the various OGC web services and to provide greater user access to EO-1 in 2008/2009
- Experimenting with OGC standards to provide easier user access to flight software

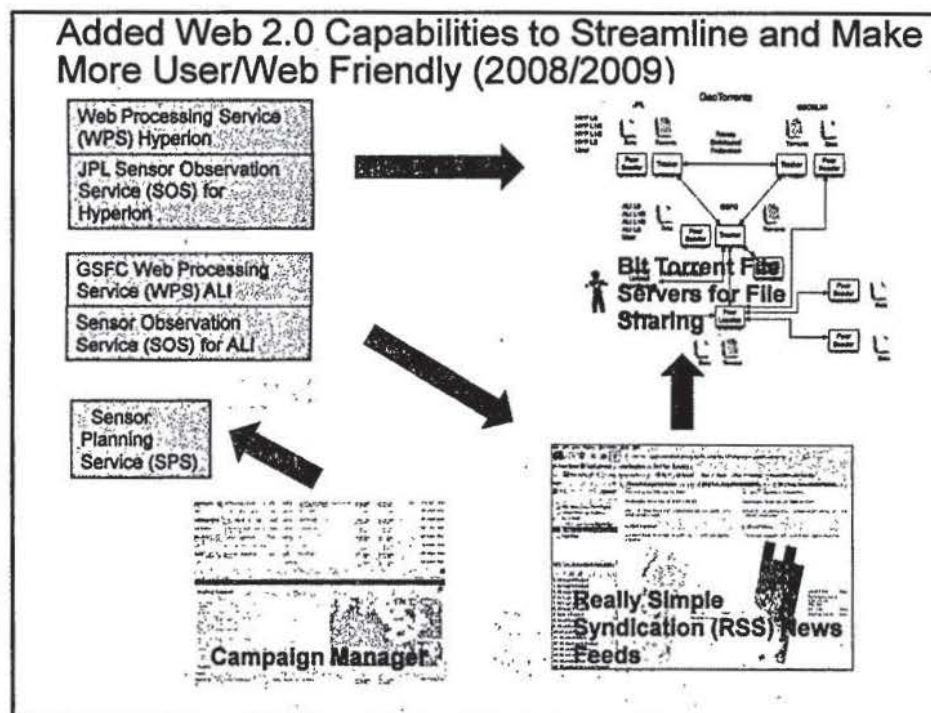
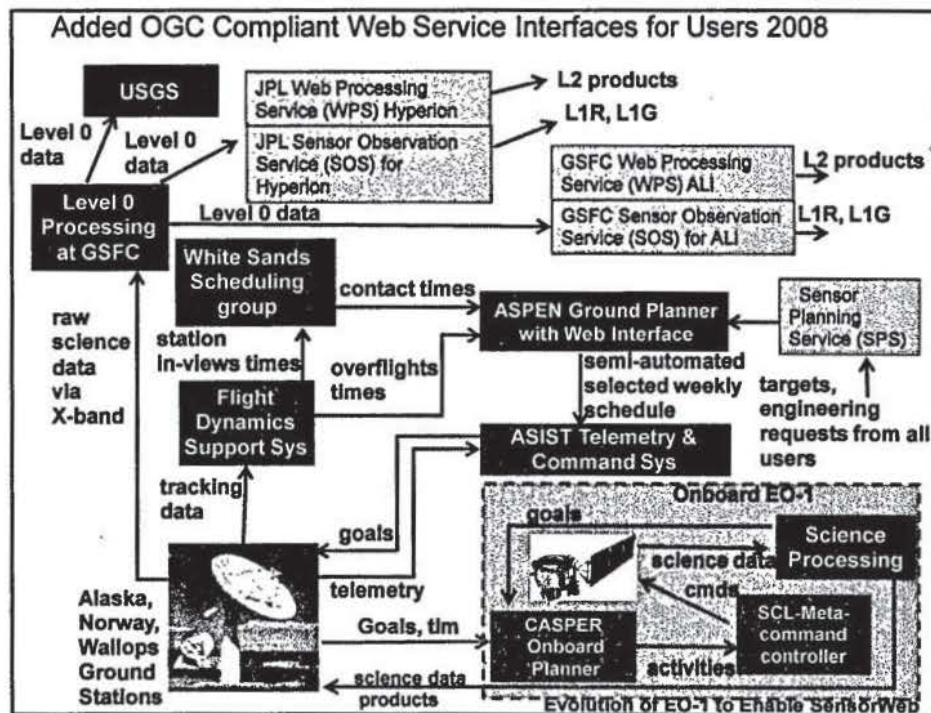
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EO-1 Original Operations Flow to Task Sensors & Access Science (2000 – 2003)

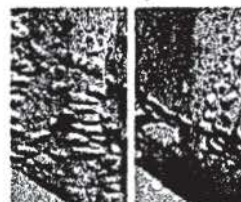
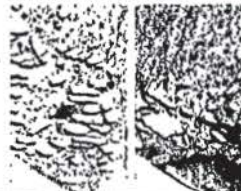


Revised Operations Flow To Task Sensors and Access Science Data Using Onboard Autonomy (2003 – 2007)





Examples of Onboard Processing with Possible Autonomous Triggers

Snow, water, ice,
land (SWIL)
classifier

**Sulfur classifier
added July 2007**

Total Images taken for life of EO-1 mission = approx 35,000

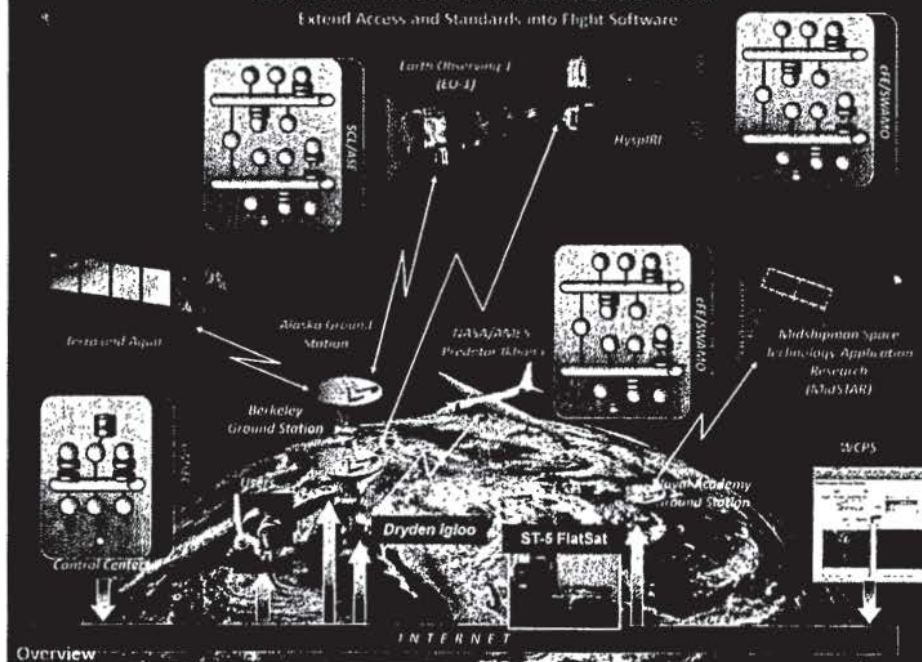
Science Topics

Station	Last Week	Yesterday	Spending
11821	79	2	45
1837	8	8	5
1251	2	0	1
238	0	0	
11223	84	10	43
3870	28	1	13
7352	50	8	30
84030	555	23	291

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SensorWeb 3G in NASA SensorWeb

Extend Access and Standards into Flight Software



SensorWeb High Level Architecture

floods, fires, volcanoes etc

Data Processing Node

- SensorML Capabilities Documents
- Web Coordinate Transformation Service (WCTS)
- Web Processing Service (WPS)
- Web Coverage Service (WCS)

RSS Feeds

Sensor Data Products

Internet

Campaign Manager

Workflow

SensorML

- SensorML Capabilities Documents
- Web Feature Service (WFS)
- Sensor Planning Service (SPS)
- Sensor Alert Service (SAS)
- Sensor Observation Service (SOS)

In-situ Sensor Data Node

UAV Sensor Data Node

Satellite Sensor Data Node

- Satellite sensor data product
- Satellite Data Node



